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ADJUSTING DEVICE

of which the following is a complete specification:

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ADJUSTING DEVICE

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims the priority of German Patent Application Serial No. 299 20 996.2, filed November 30, 1999, the subject matter of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] The present invention relates, in general, to an adjusting device, and more particularly to an adjusting device of a type including a lifting mechanism and a rotary drive having an output member coupled to a lifting arm of the lifting mechanism, with the lifting arm articulated to a component of a stationary supporting structure for movement of the component between two end positions.

[0003] An adjusting device of this type can be configured for a wide variety of applications. Unlike the rotary drive which normally remains unchanged regardless for which application it is used, the lifting mechanism is configured to suit the application at hand. The adjusting device, involved here, is in particular suitable for applications in which the stationary supporting structure is made of a frame or configured as a frame, and the component being moved is also of

frame-like design and swingably mounted to the supporting structure. The rotary drive is typically a dc gear motor operated with a safety voltage and at an output speed which is fairly small compared to the speed of the rotor of the dc motor.

[0004] The adjusting device is especially used for so-called mass products and thus should be as inexpensive as possible.

[0005] Normally, the rotary drive is secured by a mounting to the stationary parts. This mounting is positioned at an offset to the moving output member of the rotary drive so that the output force of the rotary drive applies a moment upon the mounting. The mounting should therefore be dimensioned accordingly; however the parts of the supporting structure fail to provide the required stability.

SUMMARY OF THE INVENTION

[0006] It is thus an object of the present invention to provide an improved adjusting device, obviating the afore-stated drawbacks.

[0007] In particular, it is an object of the present invention to provide an improved adjusting device with a lifting mechanism which can be suited to the type and operation of the component being moved and is easy and inexpensive to couple to the output member of the rotary drive.

[0008] These objects, and others which will become apparent hereinafter, are attained in accordance with the present invention by providing a lifting mechanism having a lifting arm operatively connected to a component of a stationary supporting structure for moving the component between two end positions, a rotary drive mechanism having an output member linked to the lifting arm, and at least one stationary support element, associated to the rotary drive mechanism, for partially or completely absorbing a load moment exerted during movement of the component.

[0009] In accordance with the present invention, the moment caused by the swinging motion can be absorbed at least partially by the stationary support element so that the mounting, required for attachment of the rotary drive, is not or only minimally exposed to stress. This is especially of advantage when the adjusting device is used to move the head portion or footrest of a slatted frame as the supporting components are normally suitable only to cope with a normal load but not with additional forces generated by the drives. The moment and the forces can now be diverted advantageously through the housing of the rotary drive, whereby it is suitable to provide each support element as a support beam which extends from one longitudinal side to the other longitudinal side of the supporting structure. In this case, the support beam extends from one side panel to the other side panel. Depending on the application at hand, the support element or support beam may be positioned relative to the rotary drive such that pressure forces are normally diverted away.

[0010] According to another embodiment of the present invention, the rotary drive may be positioned between two support elements in the form of support beams. In this case, tensile forces as well as pressure forces may be absorbed by the support beams. Depending on the type of use, the support beams may extend horizontally or also vertically, and may form a guide in particular in vertical disposition. This may be necessary, for example, when incorporating the adjusting device in a seating furniture.

[0011] According to another embodiment of the present invention, the housing of the rotary drive may be supported indirectly by the support beam. This can be implemented, for example, by attaching a fork head with aligned bores to the housing of the rotary drive or forming in the housing wall aligned bores, for passage of the support beam through the bores of the fork head or the bores of the housing wall.

[0012] A particularly simple and operatively safe connection between the output member of the rotary drive and the lifting arm of the lifting mechanism can be realized by form-fittingly connecting the output member of the rotary drive with the lifting arm of the lifting mechanism. In this way, an adjustment of the lifting arm with respect to the output member of the rotary drive is also avoided.

[0013] Suitably, the output member of the rotary drive may be formed by a rotation part with a polygonal bore for snug-fit passage of a crossbar through the

[0014] The rotary drive is suitably mounted in the area of one longitudinal side of the supporting structure to provide superior accessibility. Advantageously, the crossbar may be attached with one rotary drive distal end to a profiled piece which is arranged at the rotary drive facing side of the one lifting arm which is positioned distal to the rotary drive. In this manner, the assembly is convenient and simplified.

[0015] In conventional adjusting devices, the movement between the end positions of the swingable component is restricted by two limit switches, which are mounted within the rotary drive on a strip. Of course, such a configuration is certainly possible also in an adjusting device according to the present invention. However, it is also possible in accordance with another feature of the present invention, to define the end positions of the movable component by at least one stop member which is either provided in the housing of the rotary drive, lifting mechanism or supporting structure. Preferred is a fixed disposition of the stop member so that a moving part of the rotary drive or of the lifting mechanism runs against the stop member in the respective end position. To prevent damage of the drive motor of the rotary drive in the event the motor is not cut immediately

when the moving part impacts the stop member, the drive motor has incorporated therein an overload relay in the power supply line for shutting down the motor when a the current exceeds a predetermined value.

BRIEF DESCRIPTION OF THE DRAWING

[0016] The above and other objects, features and advantages of the present invention will be more readily apparent upon reading the following description of preferred exemplified embodiments of the invention with reference to the accompanying drawing, in which:

[0017] FIG. 1 is a schematic side view of one embodiment of an adjusting device according to the present invention, mounted to an exemplified slatted frame in one end position;

[0018] FIG. 2 is a cutaway view of the adjustment device of FIG. 1 showing a variation for support of the rotary drive;

[0019] FIG. 3 is a cutaway view of the adjustment device of FIG. 1 showing another variation for support of the rotary drive;

[0020] FIG. 4 is a schematic side view of the adjusting device of FIG. 1, showing the slatted frame in an intermediate position;

FIG. 10, showing the footrest in the other fully extended end position.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0029] Throughout all the Figures, same or corresponding elements are generally indicated by same reference numerals.

[0030] Turning now to the drawing, and in particular to FIG. 1, there is shown a schematic side view of one embodiment of an adjusting device according to the present invention, generally designated by reference numeral 10 and mounted to an exemplified slatted frame, generally designated by reference numeral 1 and including spaced-apart stationary side panels 20 (only one side panel 20 is visible in FIG. 1), a back portion 19 which is swingable mounted to the side panels 20 for rotation about a pivot axis 21, and a head portion 22 which is swingably mounted to the back portion 19 for rotation about a pivot axis 23. The adjusting device 10 includes a rotary drive mechanism, generally designated by reference numeral 11, and a lifting mechanism, generally designated by reference numeral 12. The rotary drive mechanism 11 includes a housing 13 and a dc motor (not shown), which is accommodated in the housing 13 and has an output member with a square bore in which a crossbar 14 in the form of a square tube is snugly fitted. Of course, the square configuration of the bore and complementary square configuration of the crossbar 14 are shown by way of example only, and may certainly be replaced by any other polygonal

1990-1991		1991-1992		1992-1993		1993-1994		1994-1995		1995-1996		1996-1997		1997-1998		1998-1999		1999-2000		2000-2001		2001-2002		2002-2003		2003-2004		2004-2005		2005-2006		2006-2007		2007-2008		2008-2009		2009-2010		2010-2011		2011-2012		2012-2013		2013-2014		2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2023-2024		2024-2025		2025-2026		2026-2027		2027-2028		2028-2029		2029-2030		2030-2031		2031-2032		2032-2033		2033-2034		2034-2035		2035-2036		2036-2037		2037-2038		2038-2039		2039-2040		2040-2041		2041-2042		2042-2043		2043-2044		2044-2045		2045-2046		2046-2047		2047-2048		2048-2049		2049-2050		2050-2051		2051-2052		2052-2053		2053-2054		2054-2055		2055-2056		2056-2057		2057-2058		2058-2059		2059-2060		2060-2061		2061-2062		2062-2063		2063-2064		2064-2065		2065-2066		2066-2067		2067-2068		2068-2069		2069-2070		2070-2071		2071-2072		2072-2073		2073-2074		2074-2075		2075-2076		2076-2077		2077-2078		2078-2079		2079-2080		2080-2081		2081-2082		2082-2083		2083-2084		2084-2085		2085-2086		2086-2087		2087-2088		2088-2089		2089-2090		2090-2091		2091-2092		2092-2093		2093-2094		2094-2095		2095-2096		2096-2097		2097-2098		2098-2099		2099-2100		2100-2101		2101-2102		2102-2103		2103-2104		2104-2105		2105-2106		2106-2107		2107-2108		2108-2109		2109-2110		2110-2111		2111-2112		2112-2113		2113-2114		2114-2115		2115-2116		2116-2117		2117-2118		2118-2119		2119-2120		2120-2121		2121-2122		2122-2123		2123-2124		2124-2125		2125-2126		2126-2127		2127-2128		2128-2129		2129-2130		2130-2131		2131-2132		2132-2133		2133-2134		2134-2135		2135-2136		2136-2137		2137-2138		2138-2139		2139-2140		2140-2141		2141-2142		2142-2143		2143-2144		2144-2145		2145-2146		2146-2147		2147-2148		2148-2149		2149-2150		2150-2151		2151-2152		2152-2153		2153-2154		2154-2155		2155-2156		2156-2157		2157-2158		2158-2159		2159-2160		2160-2161		2161-2162		2162-2163		2163-2164		2164-2165		2165-2166		2166-2167		2167-2168		2168-2169		2169-2170		2170-2171		2171-2172		2172-2173		2173-2174		2174-2175		2175-2176		2176-2177		2177-2178		2178-2179		2179-2180		2180-2181		2181-2182		2182-2183		2183-2184		2184-2185		2185-2186		2186-2187		2187-2188		2188-2189		2189-2190		2190-2191		2191-2192		2192-2193		2193-2194		2194-2195		2195-2196		2196-2197		2197-2198		2198-2199		2199-2200		2200-2201		2201-2202		2202-2203		2203-2204		2204-2205		2205-2206		2206-2207		2207-2208		2208-2209		2209-2210		2210-2211		2211-2212		2212-2213		2213-2214		2214-2215		2215-2216		2216-2217	
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[0032] The housing 13 of the rotary drive mechanism 11 is supported by a support member in the form of a beam 16 which extends parallel to the crossbar 14 and is intended to absorb pressure forces acting on the rotary drive mechanism 11 when the lifting mechanism 12 is lowered. The support beam 16 can be secured in a suitable manner with their ends to the stationary side panels 20 of the slatted frame 1. Persons skilled in the art will understand that the disposition of the support beam 16 is, however, dependent on the application at hand and may differ from the one shown in FIG. 1.

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certainly within the scope of the present invention to position the support beams 16, 17 in a vertical orientation in the event some applications require such a disposition.

[0034] In accordance with another variation, as shown in FIG. 3, the housing 13 of the rotary drive mechanism 11 is provided on the side distal to the output member with a fork head 18 or tab. The fork head 18 has aligned bores 2 for snug-fittingly receiving a support member 16 in the form of a rod. As an alternative, the housing 13 may also be formed with two aligned bores for receiving such a rod. Which configuration of the adjusting device 10 is employed is dictated by the application at hand.

[0035] Referring back to FIG. 1, the housing 13 of the rotary drive mechanism 11 is secured to one of the side panels 20 of the slatted frame 1 by a mounting 26, so that the side panel 20 represents the stationary support structure for the adjusting device 10.

[0036] When the dc motor of the rotary drive mechanism 11 is activated, the slanted lifting arm 15 is moved into a horizontal disposition to thereby move the head portion 22 via the swing link 3 and bracket 4 into a slanted disposition, as shown in FIG. 4. Upon further swinging of the lifting arm 15 by the dc motor, the head portion 22 conjointly moves the back portion 19 until reaching an end position in which the back portion 19 also assumes a slanted disposition, as

shown in FIG. 5. Suitably, this end position is defined by a stationary stop member (not shown here), which may project out from the housing 13 or the mounting 26. Lowering of the back portion 19 and the head portion 22 is implemented through reversing the rotation direction of the dc motor.

[0037] Turning now to FIG. 6, there is shown a schematic side view of another embodiment of an adjusting device 10 according to the present invention, mounted to an exemplified slatted frame 1. Parts corresponding with those in FIG. 1 are denoted by identical reference numerals and not explained again. In this embodiment, the slatted frame 1 is devoid of a head portion so that the lifting mechanism 11 can have a simplified configuration. The swingable lifting arms 15 extend underneath in direct contact with the side panels 20 of the swingable back portion 19. Friction between the lifting arms 15 and the underside of the side panels 20 is reduced through the provision of sliders 24 which are made of suitable material known to the artisan and are attached to the free ends of the lifting arms 15.

[0038] When the dc motor of the rotary drive mechanism 11 is activated, the horizontal lifting arms 15 are moved upwardly to thereby move the back portion 19 from the horizontal disposition, shown in FIG. 6, into an intermediate incline position, shown in FIG. 7, as the sliders 24 move along the side panels 20. Upon further swinging of the lifting arms 15 by the dc motor, the back portion 19 moves to the end position, as shown in FIG. 8. Lowering of the back

[0040] As shown in FIG. 9, which is a top view of the adjusting device of FIG. 6, the crossbar 14 for interconnecting the lifting arms 15 is made of two parts and includes the actual crossbar 14 and a profiled piece 27. The rotary drive mechanism 11 is bolted via the mounting 26 to one side panel 20. To simplify the assembly, the profiled piece 27 is secured to the lifting arm 15, which is distal to the rotary drive mechanism 11, and points toward the rotary drive mechanism 11 for receiving the confronting end of the crossbar 14.

[0041] Turning now to FIG. 10, there is shown a schematic side view of yet another embodiment of an adjusting device according to the present invention, mounted to an exemplified chair 29 for adjustment of a footrest 28, shown in stowed end position. Parts corresponding with those in FIG. 1 are denoted by identical reference numerals and not explained again. In this embodiment, the lifting mechanism 12 is used to move the footrest 28 from the stowed end position to a fully extended shown in FIG. 12 and includes a pantograph linkage system 31 for implementing articulated movement of the footrest 28 between the stowed and extended positions. In general, the linkage system 31 is connected between the footrest 28 and the stationary frame of the chair 29 and includes a plurality of links interconnected in a manner generally known to the artisan and not described herein in more detail.

[0042] Persons skilled in the art will understand that the pantographic linkage system 31 is duplicated on the opposite side of the chair 29. For

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